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Ahola et al.

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(54) **TOILET WITH NON-VITREOUS FLUSH ENGINE**

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E03D 11/02	(2006.01)

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CPC ***E03D 11/13*** (2013.01); ***E03D 1/26*** (2013.01); ***E03D 11/02*** (2013.01)

(58) **Field of Classification Search**
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(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

231,687 A	8/1880	Smith
2,749,968 A	6/1956	Suser

(Continued)

FOREIGN PATENT DOCUMENTS

CN	1532353 A	9/2004
CN	102776934 A	11/2012

(Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion re Application No. PCT/US19/45312; 11 pgs.

(Continued)

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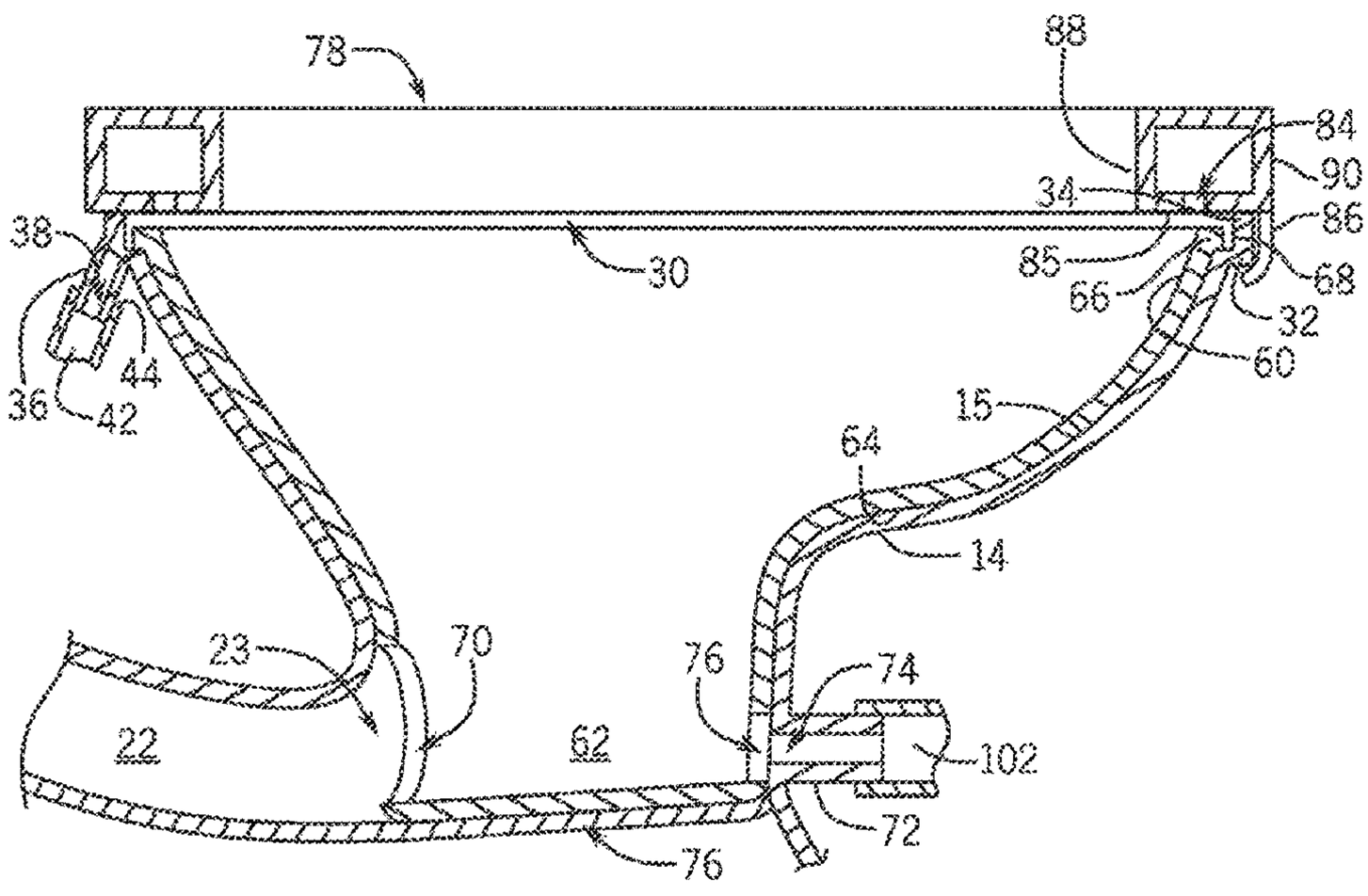
(57) **ABSTRACT**

A toilet assembly includes a flush engine having a bowl defining a sump and a trapway extending from the sump. A bowl insert is configured to be located in the bowl and a shroud is configured to be positioned over the flush engine to conceal at least a portion of the flush engine.

19 Claims, 7 Drawing Sheets



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(60) Provisional application No. 62/715,431, filed on Aug. 7, 2018.

(58) **Field of Classification Search**
CPC E03D 11/06; E03D 11/18; E03D 11/13; E03D 3/10; E03D 11/00
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,262,132	A	7/1966	Mann
3,843,977	A	10/1974	Garnett
3,965,493	A	6/1976	Bemis
4,041,554	A	8/1977	Gregory et al.
4,144,903	A	3/1979	Gregory et al.
4,145,772	A	3/1979	Whitney et al.
4,195,374	A	4/1980	Hafner et al.
4,237,934	A	12/1980	Brian et al.
5,231,706	A	8/1993	Kendall
5,909,968	A	6/1999	Olin et al.
6,212,700	B1	4/2001	Giesler et al.
7,861,331	B2	1/2011	Grech et al.
3,191,182	A1	6/2012	Mauduit
8,276,218	B2	10/2012	Grech
2005/0115042	A1	6/2005	Davies et al.
2009/0019630	A1	1/2009	Bernabei et al.
2014/0208498	A1	7/2014	Beach et al.
2014/0259350	A1	9/2014	Davis et al.
2014/0259351	A1	9/2014	Spankowski et al.
2015/0267388	A1	9/2015	Bhardwaj et al.
2018/0112383	A1	4/2018	Le

FOREIGN PATENT DOCUMENTS

CN	204876009	U		12/2015
CN	107975122	A		5/2018
CN	108286285	A		7/2018
JP	2603698	B2		2/1990
JP	7005499	A		1/1995
JP	H09144115	A		6/1997
JP	H09158285	A		6/1997
JP	H11107344	A		4/1999
JP	4720680	B2		3/2008
WO	WO 8603241	A1	*	6/1989
WO	2006096947	A3		11/2006
WO	2014066187	A1		5/2014

OTHER PUBLICATIONS

Chinese Office Action for Chinese Application No. 201980052561.7, dated Dec. 2, 2021.

* cited by examiner

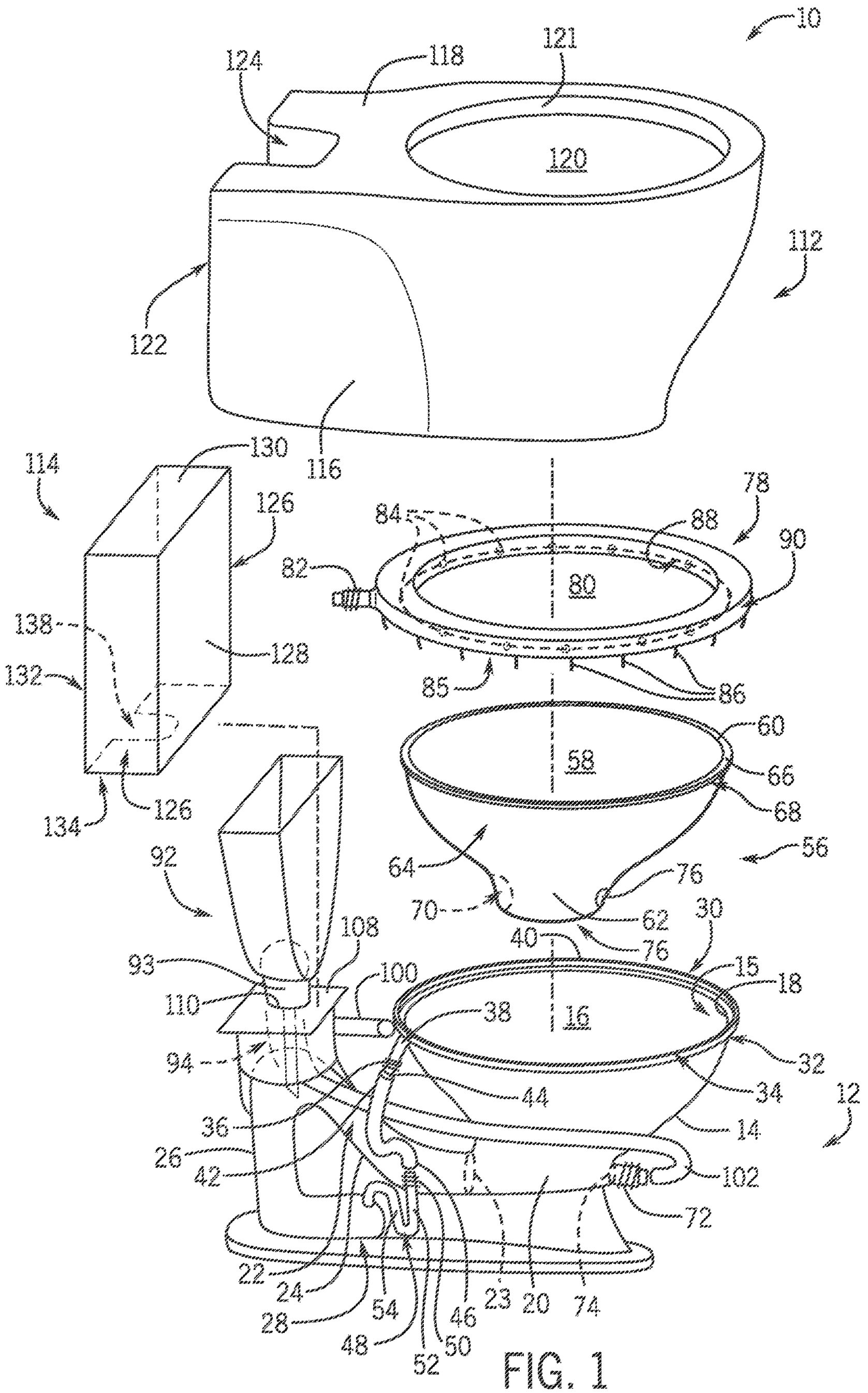
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FIG. 1

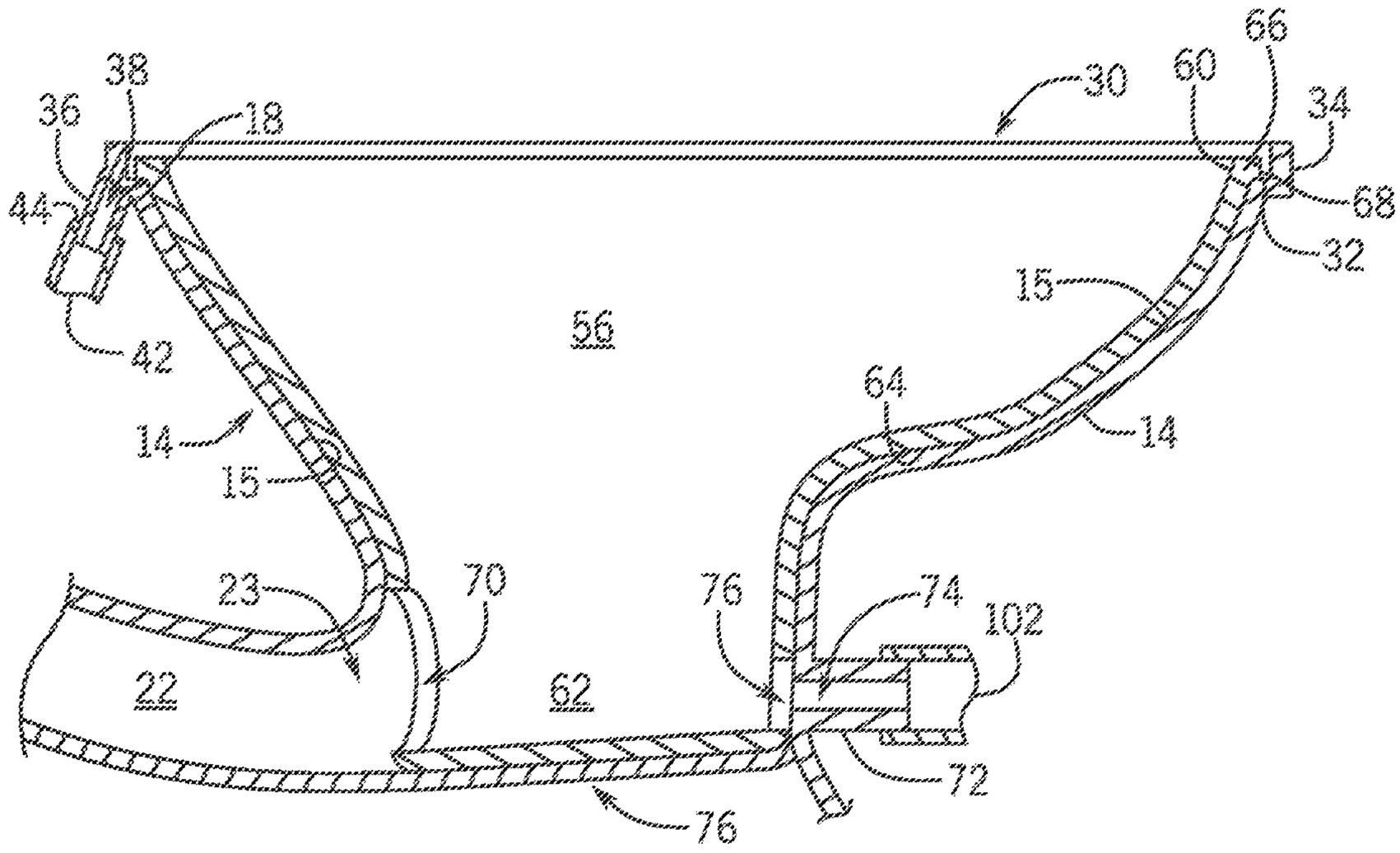
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FIG. 2

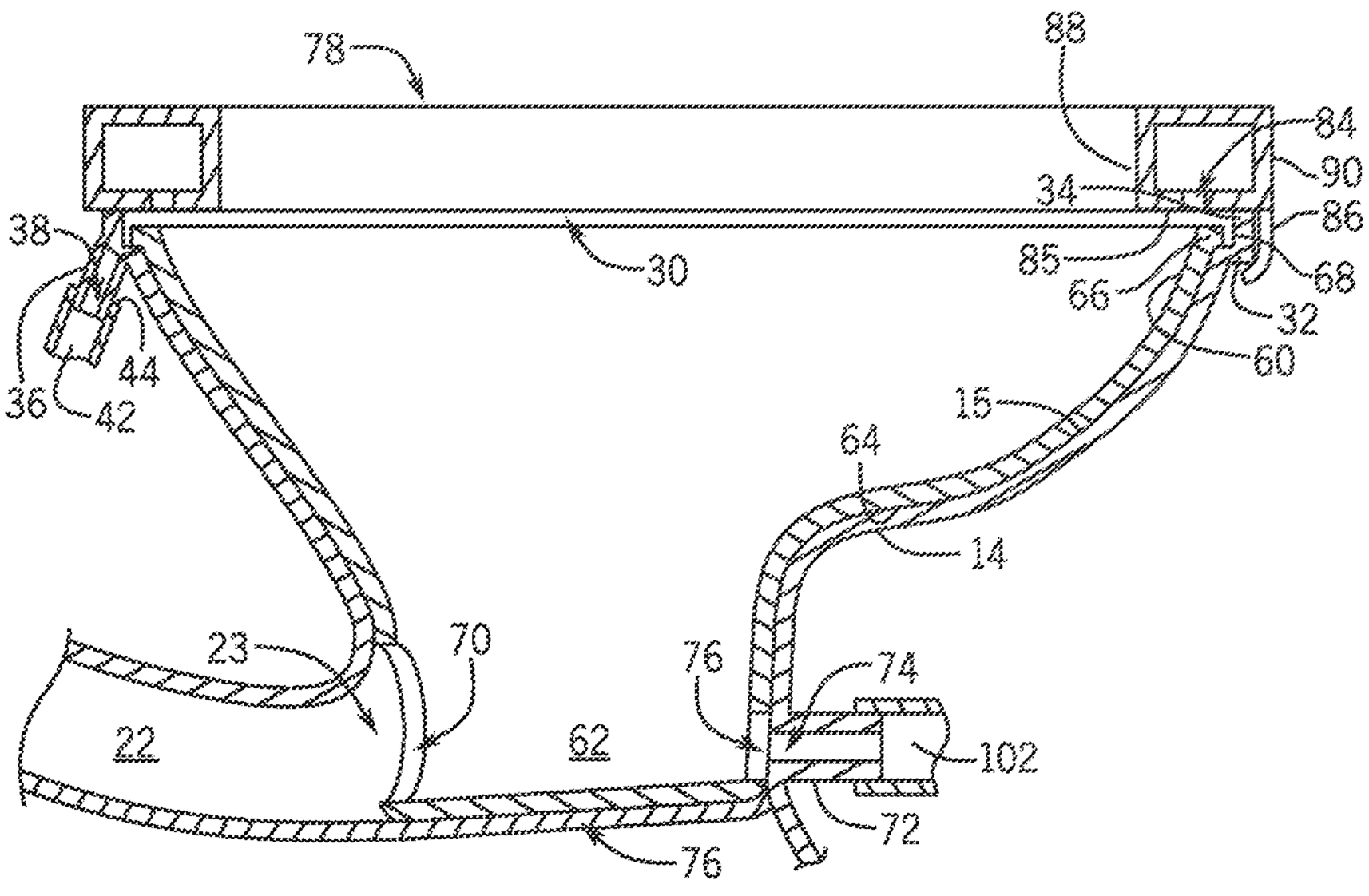
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FIG. 3

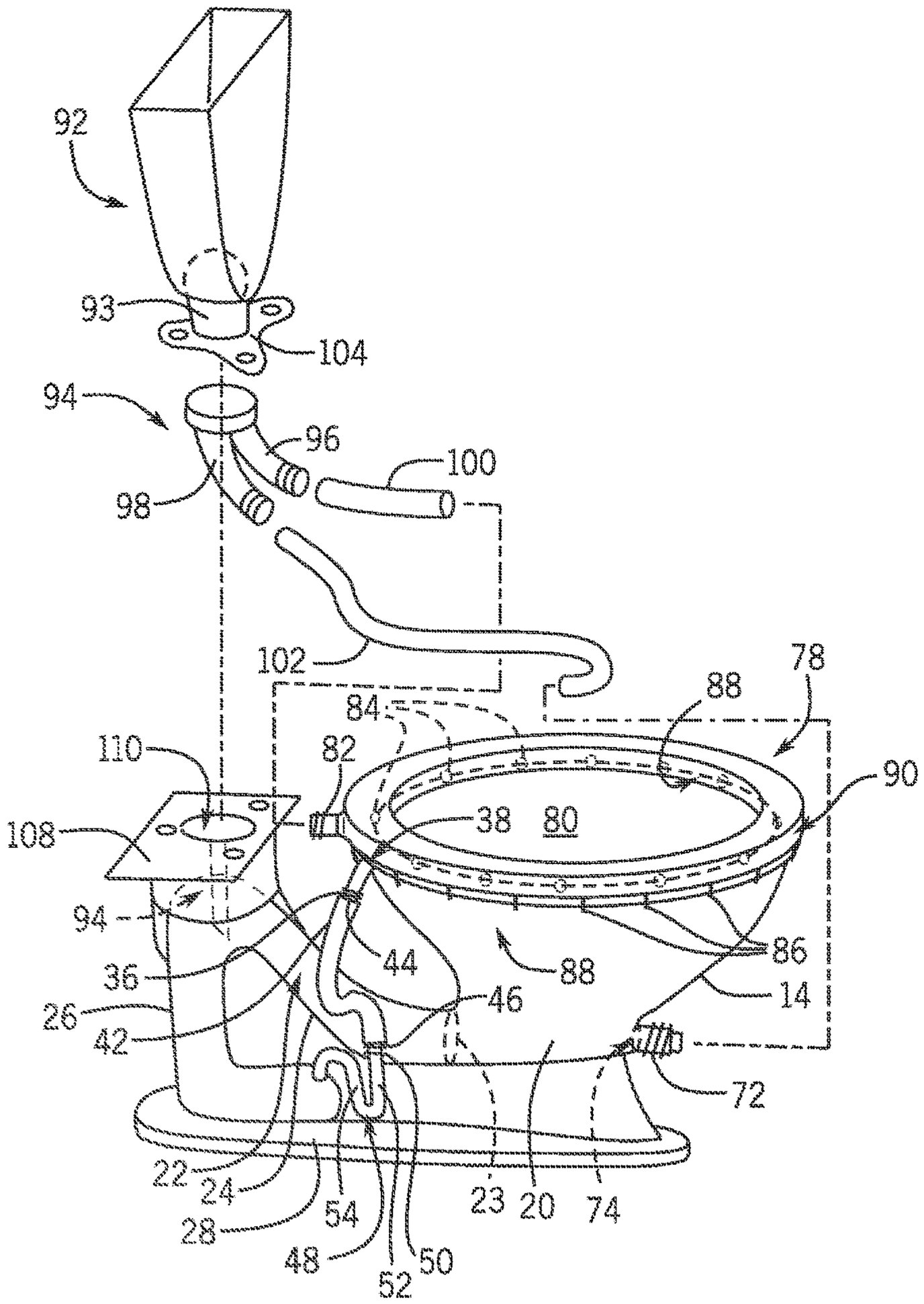
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FIG. 4

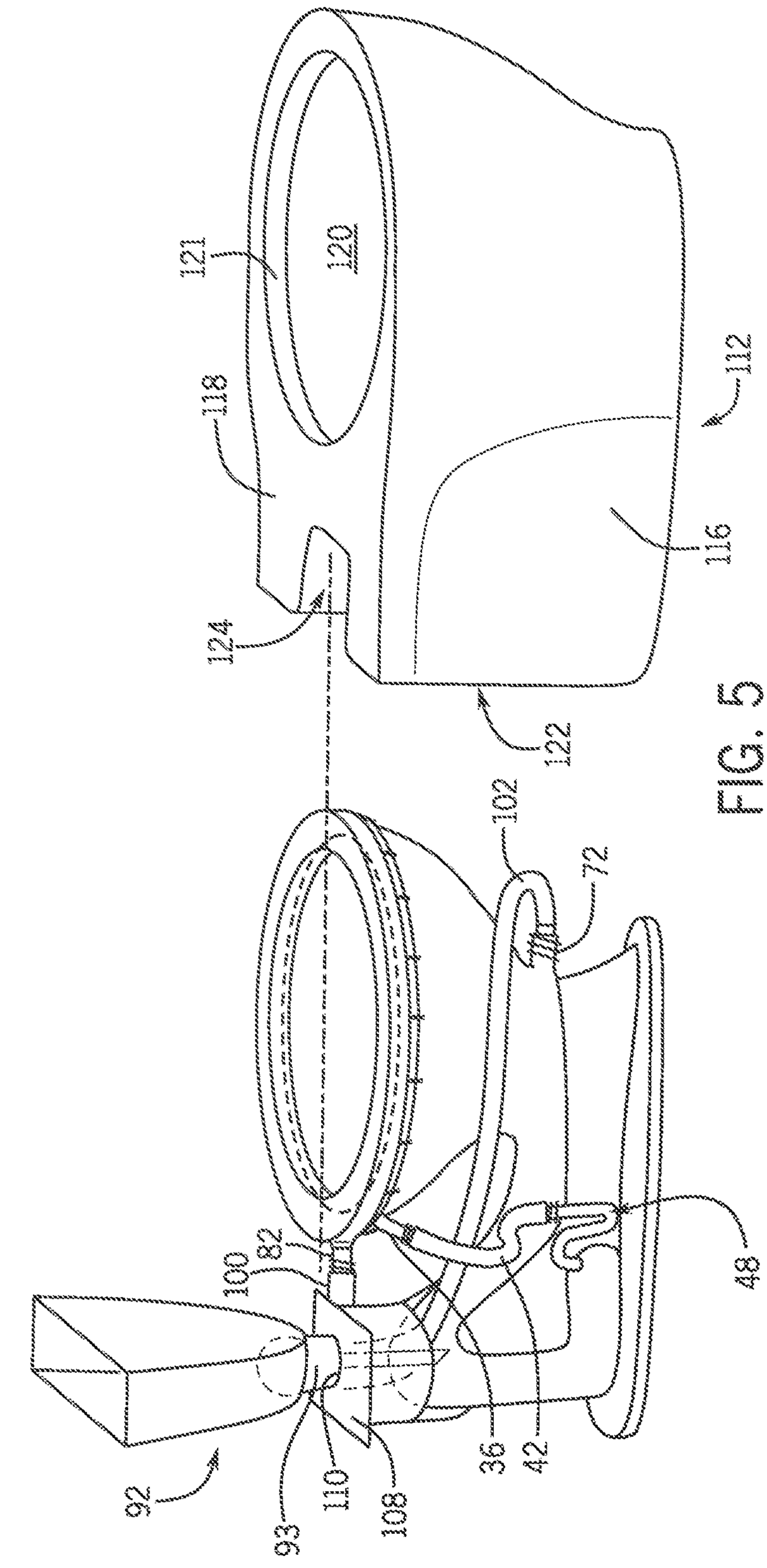


FIG. 5

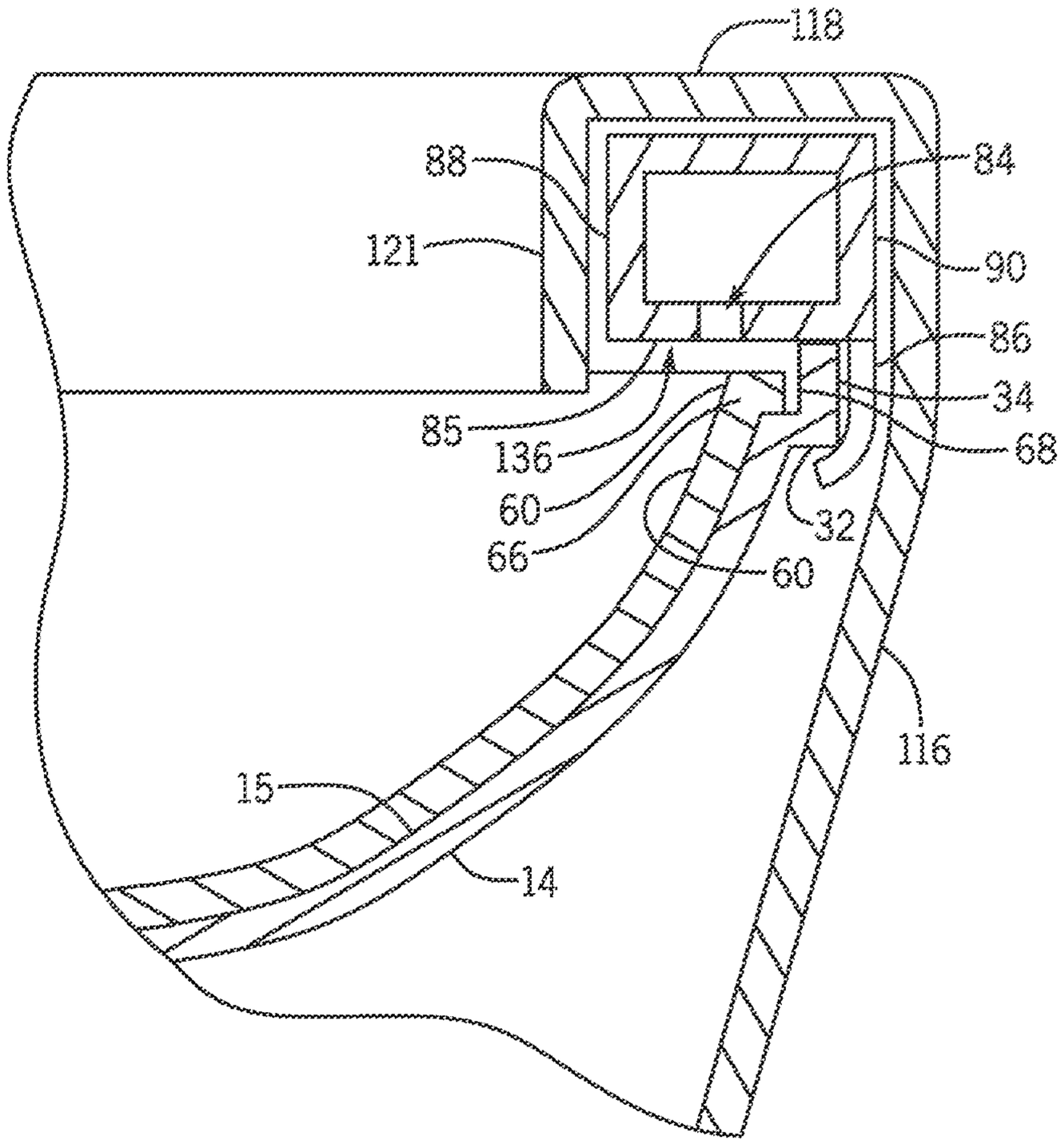


FIG. 6

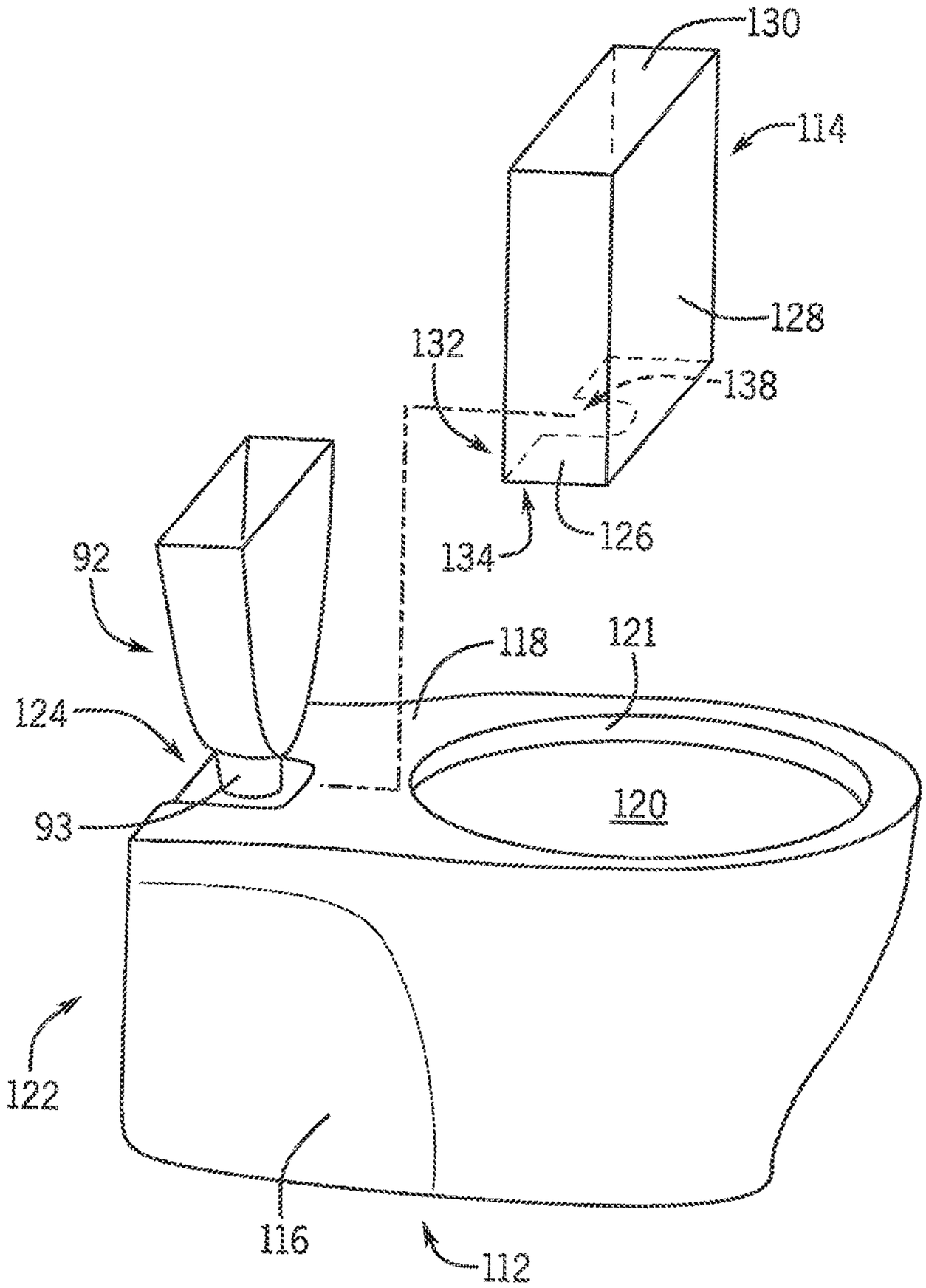
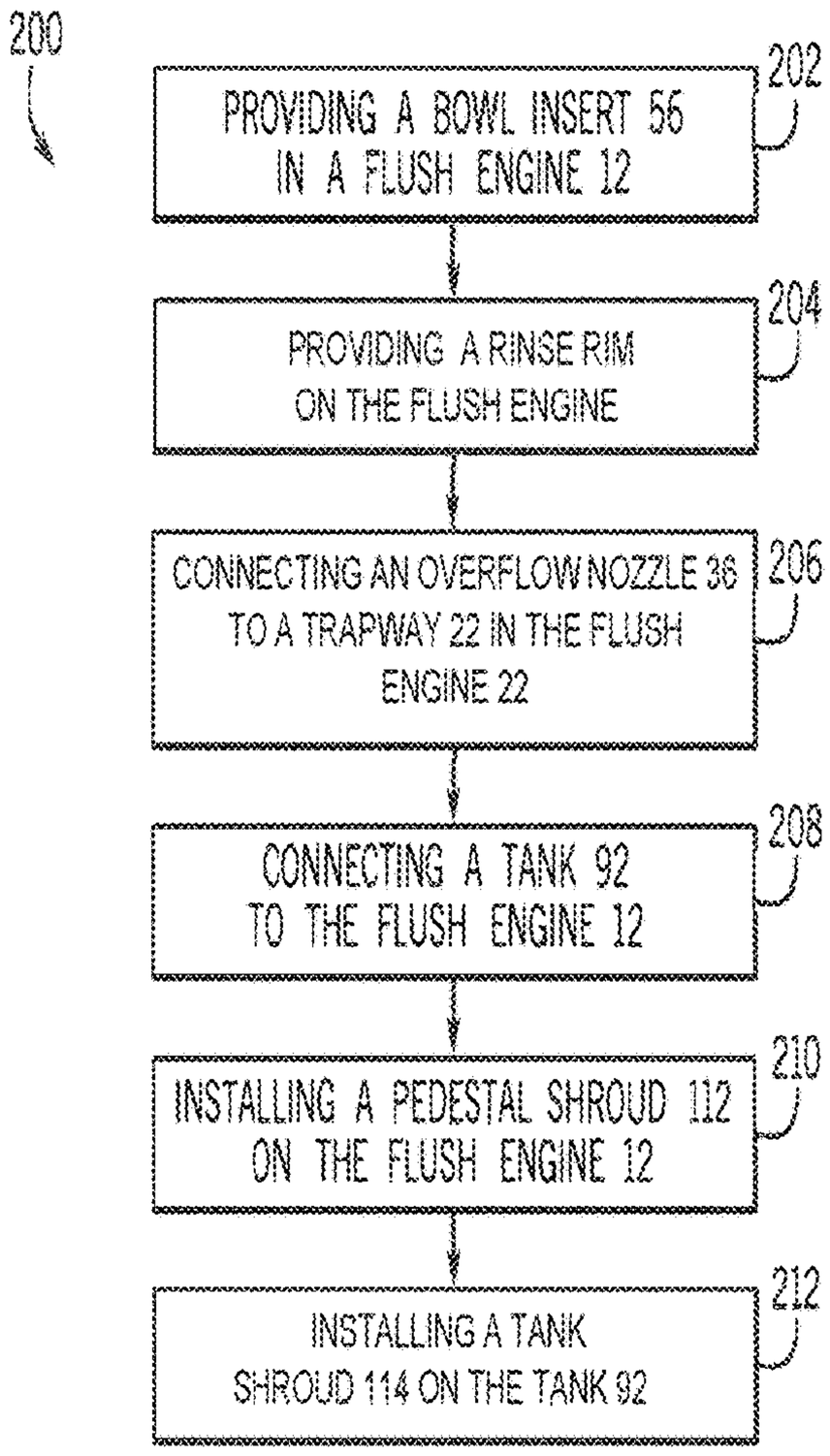


FIG. 7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PROVIDING A BOWL INSERT 56 IN A FLUSH ENGINE 12
202
PROVIDING A RINSE RIM ON THE FLUSH ENGINE
204
CONNECTING AN OVERFLOW NOZZLE 36 TO A TRAPWAY 22 IN THE FLUSH ENGINE 22
206
CONNECTING A TANK 92 TO THE FLUSH ENGINE 12
208
INSTALLING A PEDESTAL SHROUD 112 ON THE FLUSH ENGINE 12
210
INSTALLING A TANK SHROUD 114 ON THE TANK 92
212

FIG. 8

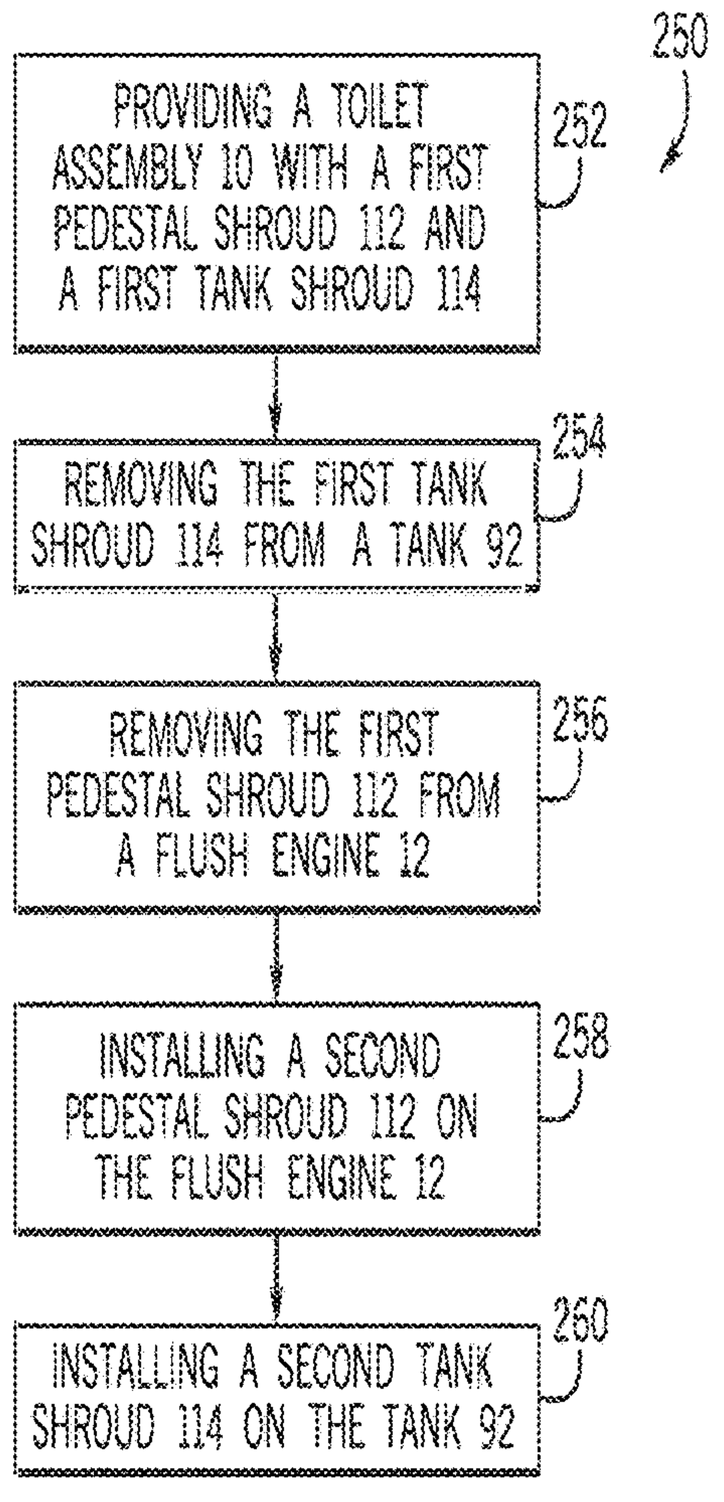
250
PROVIDING A TOILET ASSEMBLY 10 WITH A FIRST PEDESTAL SHROUD 112 AND A FIRST TANK SHROUD 114
252
REMOVING THE FIRST TANK SHROUD 114 FROM A TANK 92
254
REMOVING THE FIRST PEDESTAL SHROUD 112 FROM A FLUSH ENGINE 12
256
INSTALLING A SECOND PEDESTAL SHROUD 112 ON THE FLUSH ENGINE 12
258
INSTALLING A SECOND TANK SHROUD 114 ON THE TANK 92
260

FIG. 9

TOILET WITH NON-VITREOUS FLUSH ENGINE

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

This application is a Continuation of U.S. patent application Ser. No. 16/533,334 filed Aug. 6, 2019, which claims priority to and the benefit of U.S. Provisional Patent Application No. 62/715,431, filed Aug. 7, 2018, the entire disclosures of which is are incorporated herein by reference.

BACKGROUND

The present application relates generally to the field of toilet assemblies having vitreous and non-vitreous components. More specifically, the present application relates to toilet assemblies having a vitreous bowl and a vitreous shroud coupled to a non-vitreous (e.g., plastic) flush engine.

Conventionally, whenever a new toilet is developed, the waterways within the toilet must be re-engineered to fit within the shape of the new toilet. For example, a waste trapway must be redesigned to fit within a new pedestal design based on the desired aesthetics. Specifically, the design for the waste trapway goes through multiple iterations in order to optimize the suction power during a flush cycle while minimizing water consumption. This re-engineering process increases the development costs for new products.

A conventional toilet can also be costly to develop due to the use of vitreous china, which provides a sanitary surface. Importantly, this sanitary surface minimizes or eliminates the presence of bacteria, waste, or other harmful chemicals being retained on the surface. However, vitreous china requires casting and firing, utilizing a manufacturing process specially developed for each new toilet design, which increases both prototyping costs and overall manufacturing costs.

In order to reduce development costs of a new toilet design, it may be advantageous to provide a standardized flush engine, which may be coupled to a vitreous bowl insert and/or enclosed in vitreous shrouds having different shapes.

SUMMARY

One embodiment relates to a toilet assembly, including a flush engine having a bowl defining a sump and a trapway extending from the sump. A bowl insert is configured to be located in the bowl and a shroud is configured to be positioned over the flush engine to conceal at least a portion of the flush engine.

One aspect of the toilet assembly relates to the flush engine being from a material that is not vitreous china.

One aspect of the toilet assembly relates to the bowl insert and the shroud both being formed from a material that is vitreous china.

One aspect of the toilet assembly relates to an overflow rim of the flush engine at an upper periphery of the bowl.

Another aspect of the toilet assembly relates to an overflow nozzle of the flush engine extending from the overflow rim and configured to pass excess water from the overflow rim to the trapway such that the excess water bypasses the bowl.

Another aspect of the toilet assembly relates to the bowl insert comprising a lip extending laterally outward from an upper periphery of the bowl insert, the lip of the bowl insert configured to engage the overflow rim when the bowl insert is received within the bowl.

Another aspect of the toilet assembly relates to the overflow rim comprises a first portion extending laterally outward from the upper periphery of the bowl and a second portion extending vertically upward from the first portion. The lip of the bowl insert is spaced apart from the second portion of the overflow rim to define a channel that provides an area for excess water to flow between the lip and the second portion of the overflow rim.

Another aspect of the toilet assembly relates to a rinse rim configured to be coupled to a top portion of the flush engine, the rinse rim defining a plurality of rinse openings configured to supply water from within the rinse rim into the bowl insert.

Another aspect of the toilet assembly relates to the trapway extending from the sump at a trapway inlet of the trapway, and the bowl insert defining a trapway opening configured to align with the trapway inlet of the trapway when the bowl insert is received in the bowl.

Another aspect of the toilet assembly relates to the flush engine comprising a sump nozzle extending from the sump of the bowl and the bowl insert defining a sump opening configured to align with the sump nozzle of the flush engine when the bowl insert is received in the bowl.

Another aspect of the toilet assembly relates to the bowl insert being located within the bowl of the flush engine such that the bowl does not directly hold any fluid.

Another embodiment relates to a flush engine for a toilet, including a bowl defining a sump and configured to receive a bowl insert, and a trapway extending from the sump. The flush engine further includes an overflow rim at an upper periphery of the bowl. The overflow rim is configured to engage a lip of the bowl insert received in the bowl.

One aspect of the flush engine relates to the bowl and the trapway being formed from a material that is not a vitreous china.

Another aspect of the flush engine relates to flush engine being configured to be at least partially received within various shrouds having different external aesthetics.

Another aspect of the flush engine relates to an overflow nozzle extending from the overflow rim and configured to pass excess water from the overflow rim to the trapway such that the excess water bypasses the bowl.

Another aspect of the flush engine relates to an overflow trapway that fluidly connects the overflow nozzle and the trapway.

Another embodiment relates to a method of assembling a toilet assembly, including providing a flush engine having a bowl defining a sump, and a trapway extending from the sump. The method further includes inserting a bowl insert into the bowl. The method further includes positioning a shroud over the flush engine to conceal at least a portion of the flush engine.

One aspect of the method relates to where the flush engine is formed from a material that is not a vitreous china, and the bowl insert and the shroud are both formed from a material that is vitreous china.

One aspect of the method relates to the shroud being a first pedestal shroud and further including removing the first pedestal shroud from the flush engine and positioning a second pedestal shroud over the flush engine, the second pedestal shroud having a different aesthetic appearance from the first pedestal shroud.

Another aspect of the method relates to coupling a rinse rim to the flush engine, providing a tank having a conduit

defining a rinse outlet and a separate sump outlet, fluidly coupling the rinse outlet to the rinse rim, and fluidly coupling the sump outlet to the sump.

The foregoing is a summary and thus by necessity contains simplifications, generalizations, and omissions of detail. Consequently, those skilled in the art will appreciate that the summary is illustrative only and is not intended to be in any way limiting. Other aspects, inventive features, and advantages of the devices and/or processes described herein, as defined solely by the claims, will become apparent in the detailed description set forth herein and taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features, characteristics, and advantages of the present disclosure will become apparent to a person of ordinary skill in the art from the following detailed description of embodiments of the present disclosure, made with reference to the drawings annexed, in which like reference characters refer to like elements.

FIG. **1** is an exploded view of a toilet assembly, according to an exemplary embodiment.

FIG. **2** shows the toilet assembly of FIG. **1** with a vitreous bowl insert received in a bowl of a non-vitreous flush engine.

FIG. **3** shows the toilet assembly of FIG. **1** with a rinse rim installed on the flush engine.

FIG. **4** is an exploded view of the toilet assembly, according to another exemplary embodiment.

FIG. **5** shows the toilet assembly of FIG. **1** with a pedestal shroud in an installed position.

FIG. **6** is a partial cross-sectional of the toilet assembly of FIG. **5**.

FIG. **7** shows the toilet assembly of FIG. **5** with a tank shroud in an installed position.

FIG. **8** is a block diagram of method of assembling a toilet assembly enclosing a standardized flush engine in a shroud.

FIG. **9** is a block diagram of method of assembling a toilet assembly, replacing a first tank and pedestal shroud with a second tank and pedestal shroud having a different aesthetic appearance.

DETAILED DESCRIPTION

Referring to the FIGURES generally, a toilet assembly is shown according to various exemplary embodiments. The toilet assembly includes a vitreous bowl insert received in a bowl of a non-vitreous flush engine, and a rinse rim disposed on the flush engine. A vitreous pedestal shroud encloses the flush engine to provide a desired outer aesthetic. During use of the toilet assembly, the user may only see and feel the vitreous china outer surface and may not be able to distinguish the toilet assembly from a conventional toilet formed entirely from vitreous china. Furthermore, the flush engine may be a standardized (i.e., uniform) part, such that the same flush engine is configured to be enclosed in shrouds having various outer shapes to provide corresponding different aesthetics.

Referring to FIG. **1**, a toilet assembly **10** is shown with a non-vitreous (e.g., plastic) flush engine **12** according to an exemplary embodiment. The flush engine **12** includes a bowl **14** (i.e., bowl portion, bowl structure, bowl support, etc.), an opening **16** defined at an upper periphery **18** of the bowl **14**, and a trapway **22**. The bowl **14** further defines an inner surface **15** and a sump **20** (i.e., sump portion) at a lower portion thereof. The trapway **22** (i.e., primary trapway) extends from a trapway inlet **23** defined at a rear portion of the sump **20** and includes a weir having an up leg **24** extending at a vertically upward incline from the sump **20** and a down leg **26** extending vertically downward from a downstream end of the up leg **24**. A drain opening **28** is defined at a downstream end of the down leg **26** and is configured to fluidly connect the trapway **22** to a drain in a building. In the configuration shown in FIG. **1**, the trapway **22** is configured as a siphonic trapway. However, it should be understood that the trapway **22** may be configured as a wash-down trapway, without the weir and both the up leg **24** and the down leg **26**. Furthermore, while FIG. **1** shows the flush engine **12** formed from a non-vitreous material, according to other exemplary embodiments, at least a portion of the flush engine **12** may be formed from a vitreous material.

The flush engine **12** further comprises an overflow rim **30** formed at and above the upper periphery **18** of the bowl **14**. The overflow rim **30** defines a generally "L"-shaped cross section as shown in FIG. **3** and comprises a first portion **32** extending laterally outward from the upper periphery **18** and a second portion **34** extending vertically upward from the first portion **32** (above the upper periphery **18** of the bowl **14**). The flush engine **12** comprises an overflow nozzle **36** that extends from the overflow rim **30** and defines an overflow nozzle inlet **38**, which is formed in at least one of the first or second portions **32**, **34** of the overflow rim **30**. Specifically, the overflow nozzle inlet **38** is defined below an upper periphery **40** of the overflow rim **30** (where the upper periphery **40** is the topmost edge of the flush engine **12** along the top of the second portion **34** of the overflow rim **30** and is positioned vertically above the upper periphery **18** of the bowl **14**, as shown in FIG. **1**). The overflow nozzle **36** fluidly connects the overflow rim **30** and the trapway **22** (via an overflow waterway **42** and an overflow trapway **48**, as described further herein) to allow water to bypass flowing through the bowl **14**, such that when a water level in the bowl **14** is above the upper periphery **18** of the bowl **14**, the excess water is output through the overflow nozzle **36**, flowing from the overflow rim **30**, through the overflow nozzle **36**, and into the trapway **22**. Accordingly, the overflow nozzle **36** and the overflow rim **30** prevent the water level from reaching or exceeding the upper periphery **40** of the overflow rim **30** and overflowing from the flush engine **12**, over the top of the upper periphery **40** of the overflow rim **30**.

It should be noted that while FIG. **1** shows the overflow rim **30** integrally formed with the rest of the bowl **14**, according to other exemplary embodiments, the overflow rim **30** may be separately formed from the rest of the bowl **14**. In this configuration, during assembly of the toilet assembly **10**, the overflow rim **30** is coupled to and sealingly engages the upper periphery **18** of the bowl **14**.

As shown in FIG. **1**, the flush engine **12** further comprises the overflow waterway **42** and the overflow trapway **48**. The overflow waterway **42** (i.e., hose, passage, line, conduit, etc.) that defines an inlet **44** configured to be fluidly coupled to the overflow nozzle **36** and an outlet **46** configured to be fluidly coupled to the overflow trapway **48** in order to fluidly connect the overflow nozzle **36** and an overflow trapway nozzle **50** of the overflow trapway **48** (via the overflow trapway **48**). The overflow trapway **48** comprises the overflow trapway nozzle **50** (i.e., inlet nozzle) at an inlet end of the overflow trapway **48**, a down leg **52** extending generally downward from the overflow trapway nozzle **50**, and an up leg **54** extending generally upward from a downstream end of the down leg **52**. The up leg **54** is fluidly connected to the

trapway **22** proximate the drain opening **28**. The overflow trapway **48** fluidly connects the overflow nozzle **36** (at an inlet end of the overflow trapway **48**, via the overflow waterway **42**) and the trapway **22** (at an outlet end of the overflow trapway **48**).

In use, water generally overflows in the bowl **14** when there is an obstruction (i.e., blockage) in the trapway **22**. Once the excess water reaches the upper periphery **18** of the bowl **18**, the excess water flows into the overflow rim **30** and then into and through the overflow nozzle **36**, the overflow waterway **42**, the overflow trapway **48**, and finally the trapway **22**. By passing the water from the overflow rim **30** to a portion of the trapway **22** proximate the drain outlet **28**, the overflowing excess water is most likely to bypass the obstruction (and the bowl **14**) and prevent overflow from the entire flush engine **12**. It should be noted that the overflow trapway **48** may be fluidly connected to the trapway **22** in other locations or may be separately output to an area outside the flush engine **12**. The overflow trapway **48** forms a water seal (e.g., air lock) between the overflow nozzle **36** and the trapway **22** which prevents gas present in the sewer line from being released through the overflow nozzle inlet **38**.

The overflow waterway **42** may be formed from plastic (e.g., polyethylene), rubber, or other non-vitreous flexible or rigid material, such that the overflow waterway **42** may be coupled to and fluidly connect the overflow nozzle **36** and the overflow trapway nozzle **50** by routing the overflow waterway **42** around various components of the flush engine **12** (such as the bowl **14** and the majority of the trapway **22**). The inlet **44** of the overflow waterway **42** may be threadably coupled to the overflow nozzle **36** or may be coupled to the overflow nozzle **36** in other ways (e.g., with a quick-connect configuration). Similarly, the outlet **46** of the overflow waterway **42** may be threadably coupled to the overflow trapway nozzle **50** or may be coupled to the overflow trapway nozzle **50** in other ways. Integrally forming waterways as part of the molded components of the flush engine **12** during a molding process may be difficult and expensive and limit the possible arrangements of the toilet assembly **10**. However, by fluidly connecting the overflow waterway **42** and the overflow trapway **48** with a separate waterway **42**, the cost and complexity of manufacturing the flush engine **12** may be reduced.

Referring still to FIG. **1**, the toilet assembly **10** further includes a vitreous bowl insert **56** (i.e., bowl) configured to be received and located in the bowl **14** of the flush engine **12**. The bowl insert **56** is received within the bowl **14** of the flush engine **12** such that the bowl **14** does not directly hold any fluid. An opening **58** is defined at an upper periphery **60** of the bowl insert **56** and a sump **62** (i.e., sump portion) is defined at a lower portion of the bowl insert **56**. A lower surface **64** of the bowl insert **56** may define a shape (i.e., profile) complementary to a shape of the inner surface **15** of the bowl **14**, such that the bowl insert **56** nests in the bowl **14**. In this configuration, the bowl insert **56** may engage and be supported by the inner surface **15** of the bowl **14** at substantially all points of the lower surface **64** (as shown in FIG. **2**).

The bowl insert **56** comprises a lip **66** that extends laterally outward from the upper periphery **60** of the bowl insert **56**. Referring now to FIG. **2**, the bowl insert **56** is shown disposed in the bowl **14**. The first and second portions **32**, **34** of the overflow rim **30** define a seat configured to receive the lip **66**. For example, the lip **66** is disposed on (e.g., engages, rests on, is supported by) the top surface of the first portion **32** of the overflow rim **30**, which corresponds to the upper periphery **18** of the bowl **14**. An outer periphery **68** of the lip **66** may engage the inner surface of the second portion **34** of the overflow rim **30**, preventing lateral movement of the bowl insert **56** within the bowl **14** and the overflow rim **30**. According to another exemplary embodiment, the outer periphery **68** may be spaced apart from the inner surface of the second portion **34**, defining a channel therebetween about the outer perimeter of the lip **66** of the bowl insert **56** and the inner perimeter of the second portion **34** of the overflow rim **30**. The channel may then provide an area for overflow excess water to flow to the overflow nozzle **36** between the outer periphery **68** of the lip **66** and the inner surface of the second portion **34** of the overflow rim **30**. For example, the channel may define an incline, such that the overflow nozzle **36** is disposed at a lowest portion of the overflow rim **30**, ensuring that all overflow water is output from the overflow rim **30** through the outlet nozzle **36**. In a configuration in which the lower surface **64** of the bowl insert **56** does not form a complementary shape to the inner surface **15** of the bowl, the lip **66** may support the bowl insert **56**, such that the bowl insert **56** is at least partially suspended in the bowl **14**.

As shown in FIG. **2**, the bowl insert **56** further defines a trapway opening **70** in the sump **62** aligned with and proximate the trapway inlet **23** of the trapway **22** when the bowl insert **56** is received within the bowl **14**, such that during a flush cycle, water and/or waste passes from within the bowl insert **56**, through trapway opening **70** of the bowl insert **56**, and into and through the trapway inlet **23** of the trapway **22** for discharge. For example, the trapway opening **70** may define a complementary profile to the trapway inlet **23** and may be disposed directly on the trapway inlet **23**, such that water and/or waste does not pass between the bowl **14** and the bowl insert **56**. According to other exemplary embodiments, a seal (e.g., gasket) may be disposed around the trapway opening **70** and trapway inlet **23**, and compressed between the bowl **14** and the bowl insert **56**, such that the bowl insert **56** sealingly engages the bowl **14** and water does not flow between the bowl insert **56** and the bowl **14**, forming a sealed passage from the sump **62** to the trapway **22**.

As shown in FIG. **2**, the bowl insert **56** is disposed on and covers the inside surfaces of the bowl **14**, such that the bowl insert **56** but not the bowl **14** is exposed to the environment (e.g., water and waste). In this configuration, substantially the entire surface that a user may interact with (and is visible to the user) is formed from vitreous china (of the bowl insert **56** (in an inner area of the toilet assembly **10**) and the shrouds **112**, **114** (in outer areas of the toilet assembly **10**, as described further herein)), rather than non-vitreous material (e.g., plastic) forming the flush engine **12** (in particular the bowl **14**), effectively providing the desired sanitary effects of vitreous china on the exposed surfaces.

Referring to FIGS. **1** and **2**, the flush engine **12** includes a sump nozzle **72**, defining a sump nozzle outlet **74** formed in the sump **20** of the bowl **14**. The sump nozzle **72** extends generally outward from the sump **20** of the bowl **14**. The bowl insert **56** defines a sump opening **76** in the sump **62** of the bowl insert **56**. The sump opening **76** is aligned with and proximate the sump nozzle outlet **74** when the bowl insert **56** is received within the bowl **14**, such that during a flush cycle, water passes from the sump nozzle **72**, into and through the sump nozzle outlet **74** and subsequently the sump opening **76**, into the sump **62** of the bowl insert **56**. For example, the water may be supplied to the sump **62** of the bowl insert **56** for generating a siphon (e.g., in a siphon toilet) or as wash-down water (e.g., in a wash-down toilet). The sump

opening **76** of the bowl insert **56** may define a complementary profile to the sump nozzle outlet **74** of the bowl **14** and may be disposed directly on the sump nozzle outlet **74**, such that water does not pass between the bowl **14** and the bowl insert **56**. According to other exemplary embodiments, a seal (e.g., gasket) may be disposed around the sump nozzle outlet **74** and the sump opening **76**, and compressed between the bowl **14** and the bowl insert **56**, such that the bowl insert **56** sealingly engages the bowl **14** and water does not flow between the bowl insert **56** and the bowl **14**, forming a sealed passage from the sump nozzle **72** to the sump **62**.

Referring again to FIG. **1**, the toilet assembly **10** further includes a rinse rim **78** configured to provide water to the bowl insert **56** during a flushing cycle. The rinse rim **78** is generally annular, having a hollow body and defining an opening **80** complementary in shape to (and optionally equal in size to or smaller than) the opening **58** of the bowl insert **56**. The rinse rim **78** may define a profile substantially similar to a profile of the lip **66** of the bowl insert **56**, such that when the rinse rim **78** is installed in the toilet assembly **10**, the rinse rim **78** vertically covers the lip **66** (as shown in FIG. **3**). As shown in FIG. **1**, a rinse nozzle **82** extends from a rear portion of the rinse rim **78** and is configured to receive water from a water supply and pass the water through the rinse rim **78**. The rinse rim **78** further defines a plurality of rinse openings **84** formed in at least one of a lower surface **85** or an inner surface **88** of the rinse rim **78** and configured to supply the water from the rinse nozzle **82** and within the rinse rim **78** (i.e., through a channel formed by the hollow body of the rinse rim **78**), into the bowl insert **56**.

Referring now to FIGS. **1** and **3**, the rinse rim **78** is configured to be coupled to a top portion of the flush engine (e.g., to the overflow rim **30** of the flush engine **12**) with, for example, an interference fit. The rinse rim **78** includes a plurality of flexible fingers **86** extending generally downward from the lower surface **85** and/or an outer periphery (e.g., outer surface) **90** of the rinse rim **78**. As shown in FIG. **3**, the plurality of fingers **86** are configured to engage around the outer surface of the overflow rim **30** (e.g., along the outer surfaces of the first portion **32** and/or the second portion **34**) with an interference fit, such that the rinse rim **78** may be coupled to (e.g., snapped on) the overflow rim **30** without the use of tools. This configuration reduces the cost and complexity of assembling the toilet assembly **10**.

When the rinse rim **78** is installed on the overflow rim **30**, the fingers **86** may extend below the first portion **32** of the overflow rim **30** and radially inward beneath the first portion **32** to form the interference fit. According to another exemplary embodiment, the second portion **34** of the overflow rim **30** may define a groove (i.e., channel, inset portion) configured to receive at least a portion of the fingers **86** extending radially inward. While FIG. **3** shows the fingers **86** extending from the rinse rim **78** and engaging the overflow rim **30**, according to other exemplary embodiments, the fingers **86** may extend generally upward from the overflow rim **30** and engage the rinse rim **78** or the rinse rim **78** may be coupled to the overflow rim **30** or other parts of the flush engine **12** in other ways.

Referring to FIGS. **1** and **4**, the toilet assembly **10** further includes a tank **92** as a water supply configured to supply water to the rinse rim **78** and to the sump **62**. The tank **92** is formed from a non-vitreous material (e.g., the same material as the rest of the flush engine **12**) and is disposed above the trapway **22**, such that water may be gravity-fed from the tank **92** to the rinse rim **78** and the sump **62**. The tank **92** narrows proximate a lower end thereof, defining a neck **93** (e.g., conduit) narrower than the rest of the tank **92**. A conduit **94** (i.e., splitter) extends downstream from the neck **93** and defines a rinse outlet **96** and a separate sump outlet **98**. As shown in FIG. **4**, a non-vitreous rinse waterway **100**, substantially similar to the overflow waterway **42**, fluidly couples the rinse outlet **96** and the rinse nozzle **82**, such that water is supplied from the tank **92** to the rinse rim **78**. Similarly, a non-vitreous sump waterway **102**, substantially similar to the overflow waterway **42** and the rinse waterway **100**, fluidly couples the sump outlet **98** and the sump nozzle **72**, such that water is supplied from the tank **92** to the sump **62**. In this configuration, water may be supplied to both the rinse waterway **100** and the sump waterway **102** from the tank **92** as part of the same actuation sequence. According to an exemplary embodiment, the tank **92** may be separately formed from and coupled to the flush engine **12**, although according to other exemplary embodiments, the tank **92** is molded as part of the flush engine **12** (e.g., integrally formed). However, the toilet assembly **10** may be modified and configured to accommodate different ways of flushing the toilet. For example, according to another embodiment, the toilet assembly **10** may be tankless (rather than using a gravity flush) and instead utilize line pressure from the wall.

Referring now to FIG. **4**, the tank **92** is shown as a separate subassembly. The tank **92** includes a flange **104** that extends laterally outward from the neck **93** and is configured to couple the rest of the tank **92** to at least one of the flush engine **12** or a shroud, as will be discussed in further detail below. For example, FIG. **4** shows a platform **108** disposed above the trapway **22** (e.g., where the trapway **22** transitions from the up leg **24** to the down leg **26**). The flange **104** may be coupled (e.g., bolted, screwed, adhered, etc.) to the platform **108**. The platform **108** defines an opening **110** therein configured to receive at least one of the neck **93** or a portion of the conduit **94**, which may be separately formed from the tank **92** and fluidly coupled to the neck **93**. While FIGS. **1-4** show the tank as a water supply, it should be understood that according to other exemplary embodiments, water may be supplied directly from a building water supply line.

As shown in FIG. **1**, the toilet assembly **10** further comprises a pedestal shroud **112** and a tank shroud **114** that are configured to be installed onto and positioned over at least a portion of the flush engine **12** to conceal at least the portion of the flush engine **12**. Due to the configuration of the toilet assembly **10**, the pedestal shroud **112** and the tank shroud **114** are fluidly separate from directly contacting any liquid within the toilet assembly **10**. The pedestal shroud **112** includes side surfaces **116** having a desired aesthetic appearance and an upper surface **118** defining an opening **120** therein. The pedestal shroud **112** further includes a shoulder **121** that extends generally downward from the upper surface **118** at a periphery of the opening **120**. The opening **120** defines a profile complementary to the opening **16** of the bowl **14** and/or the opening **58** of the bowl insert **56**. The pedestal shroud **112** is generally hollow and does not include a back, such that the pedestal shroud **112** may be installed by sliding the pedestal shroud **112** generally rearward along and over the flush engine **12**, as shown in FIG. **5**. In other words, an open rear end **122** of the pedestal shroud **112** is moved from the bowl **14** toward the tank **92** during installation until the flush engine **12** is positioned and received within the pedestal shroud **112**. According to another exemplary embodiment, the pedestal shroud **112** may include a back. In this configuration, the flush engine **12** may be received in the pedestal shroud **112** through a corresponding opening in a bottom surface of the pedestal shroud **112** or may be received in the pedestal shroud **112** during the casting

process of the pedestal shroud **112**. In this or other configurations, the flush engine **12** may be inserted into the pedestal shroud **112** before the toilet assembly **10** is installed on a floor or against a wall in a bathroom.

As shown in FIGS. **1** and **5**, the upper surface **118** defines a slot **124** extending from the rear end **122** toward the opening **120**. The slot **124** is configured to receive the neck **93** of the tank **92** therein, such that the tank **92** may be integrally formed with the flush engine **12** and/or may be coupled to the flush engine **92** before the pedestal shroud **112** is installed.

Where the tank **92** is separate from the flush engine **12** (e.g., as shown in FIG. **4**), the tank **92** may be coupled to the pedestal shroud **112** by coupling the flange **104** to the upper surface **118** of the pedestal shroud **112** proximate the slot **124**. At least one of the neck **93** or the conduit **94** extends through the slot **124**. According to another exemplary embodiment, where the tank **92** is separate from the flush engine **12**, the slot **124** may be formed as an opening (i.e., hole, orifice, etc.) spaced apart from the rear end **122** of the pedestal shroud **112**. In this configuration, the neck **93** and/or the conduit **94** is passed through the slot **124** after the pedestal shroud **112** is installed on the flush engine **12**. While FIG. **5** shows the pedestal shroud **112** with an open rear end **122**, according to an exemplary embodiment, a cover may be installed on the pedestal shroud **112** after the pedestal shroud **112** is installed on the flush engine **12**, thereby enclosing the flush engine **12** along all sides with the pedestal shroud **112** and the cover.

Referring now to FIG. **6**, a cross-section of a portion of the toilet assembly **10** of FIG. **5** is shown, according to an exemplary embodiment. As shown in FIG. **6**, the shoulder **121** of the pedestal shroud **112** extends below the lower surface **85** of the rinse rim **78**, such that the rinse rim **78** is completely concealed within the pedestal shroud **112** from view when the pedestal shroud **112** is installed. The rinse rim **78** is disposed laterally between the shoulder **121** and the side surface **116** of the pedestal shroud **112**. For example, the inner surface **88** of the rinse rim **78** may be disposed on or proximate the shoulder **121** regardless of the position of the side surface **116**. The rinse openings **84** are formed in the rinse rim **78** radially inward from the lip **66** of the bowl insert **56**, such that when water is introduced through the rinse openings **84**, the water passes vertically downward along the bowl insert **56** rather than along the lip **66** and into the overflow rim **30**. In this configuration, the rinse rim **78** does not need to sealingly engage the overflow rim **30**, because even if the water level in the bowl insert **56** rises, the presence of the overflow nozzle **36** (as shown in FIG. **2**) prevents the water level from reaching the connection point (e.g., seam) between the overflow rim **30** and the rinse rim **78**, which may otherwise need to be sealed to prevent leakage therebetween in the event of an overflow.

As shown in FIG. **6**, when the rinse rim **78** is installed on the overflow rim **30**, a vertical gap **136** (i.e., space, offset, etc.) is defined between the top surface of the lip **66** and the lower surface **85** of the rinse rim **78**. This gap **136** allows for water to pass over the lip **66** (between the top surface of the lip **66** and the lower surface **85** of the rinse rim **78**) and into the overflow rim **30** during an overflow condition. A height of the second portion **34** of the overflow rim **30** (that is above the top surface of the lip **66**) may define the height of the gap **136**. FIG. **6** further shows the finger **86** engaging the overflow rim **30** with an interference fit.

Referring now to FIGS. **1** and **7**, the tank shroud **114** is shown being installed on the flush engine **12**. The tank shroud **114** includes side surfaces **126**, a front surface **128**, and an upper surface **130** having a desired aesthetic appearance. The tank shroud **114** is generally hollow and does not include a back, such that the tank shroud **114** may be installed by sliding the tank shroud **114** generally rearward along the flush engine **12**. In other words, an open rear end **132** of the tank shroud **114** is moved from over the bowl **14** toward the tank **92** until the tank **92** is positioned and received within the tank shroud **114**. According to other exemplary embodiments, the tank shroud **114** includes a back and the tank **92** is received in the tank shroud **114** in other ways. For example, the tank shroud **114** may define an opening in a lower surface **134** configured to receive the tank **92** therethrough, such that the tank shroud **114** may be lowered onto and over the tank **92**. According to another exemplary embodiment, where the tank **92** is separable from the rest of the flush engine **12**, the tank **92** may be lowered into the tank shroud **114**. In this configuration, the tank **92** may be coupled to the flush engine **12** either before or after being inserted into the tank shroud **114**.

Referring still to FIGS. **1** and **7**, the lower surface **134** defines a slot **138** extending from the rear end **132** toward the front surface **128**. The slot **138** may be substantially the same as the slot **124** in the pedestal shroud **112** and is configured to receive the neck **93** of the tank **92** therein. The tank shroud **114** is installed on the pedestal shroud **112** by resting the lower surface **134** of the tank shroud **114** on the upper surface **118** of the pedestal shroud **112**. In this configuration, the tank shroud **114** may be coupled to the pedestal shroud **112**. According to other exemplary embodiments, the tank shroud **114** may be spaced apart from the pedestal shroud **112** based on a desired aesthetic appearance.

As discussed above, the pedestal and tank shrouds **112**, **114** are formed from a material that is vitreous china and provide a sanitary outer surface of the toilet assembly **10**. Further, the bowl insert **56** is also formed from a material that is vitreous china. When the toilet assembly **10** is fully assembled, the bowl insert **56** conceals the inner surface **15** of the bowl **14** from view and the pedestal shroud **112** and/or the tank shroud **114** conceals the rest of the flush engine **12** from view. In this configuration, while the flush engine **12** (in particular the bowl **14** and trapway **22**) is formed from a material that is not vitreous china (i.e., a non-vitreous material), the entire flush engine **12** is concealed such that a user may only see and feel a vitreous china outer surface. It is noted that the flush engine **12**, the bowl insert **56**, the shrouds **112**, **114**, the tank **92**, and the rinse rim **78** may each be separately formed from each other.

FIGS. **1**, **5**, and **7** show one aesthetic configuration of the pedestal shroud **112** and the tank shroud **114**. However, it should be noted that the same flush engine **12** may be used with and configured to be at least partially received within various pedestal shrouds **112** and/or tank shrouds **114** having different external aesthetic appearances. For example, in an assembly line, first and second pedestal shrouds **112** having different outer shapes may be provided. A flush engine **12** is also provided, which is configured to be received in either of the first and second pedestal shrouds **112**. Similarly, first and second tank shrouds **114** having different outer shapes may be provided. The tank **92** may be standardized in the same way as the flush engine **12**, such that the tank **92** is configured to be received in either of the first and second tank shrouds **114**. According to another exemplary embodiment, the first pedestal shroud **112** and/or the first tank shroud **114** may be removed from the flush engine **12** and replaced with the second pedestal shroud **112** and/or the second tank shroud **114**. As a result of this replacement, the flush engine **12** may remain installed in a bathroom, while

the shrouds are changed to provide a different aesthetic appearance. Advantageously, the interchangeability of the shrouds allows for easily changing the appearance of the toilet assembly **10**, while minimizing or eliminating the need to further plumb the toilet assembly **10**.

The toilet assembly **10** can be used within commercial toilets (e.g., for use in airports, restaurants, or other high-traffic areas) or for in-home, non-commercial use. The toilet can be configured as a gravity fed (e.g., that includes a toilet tank that introduces water into the bowl through gravity) or may be configured as a line pressure toilet that does not include a tank but utilizes water flowing in from a water line directly to the bowl and rim areas. Additionally, the toilet assembly **10** may include a flushometer in order to meter the fluid flow to the bowl and/or rim.

Referring now to FIG. **8**, a method **200** of manufacturing a toilet assembly **10** is shown according to an exemplary embodiment. In a first step **202**, a bowl insert is provided in a bowl of a universal flush engine. For example, with reference to the accompanying figures, a bowl insert such as bowl insert **56** is provided in or inserted into the bowl **14** of the flush engine **12**.

This may be a manual process or may utilize an assembly robot. According to other embodiments, the flush engine **12** may be inverted and provided onto the bowl insert **56**, which is also inverted. When the bowl insert **56** is provided in the bowl **14**, the trapway opening **70** of the bowl insert **56** is substantially aligned with the trapway inlet **23** and/or the sump opening **76** is substantially aligned with the sump nozzle **72**.

In a second step **204**, a rinse rim is provided on an overflow rim of the flush engine. For example, with reference to the accompanying figures, a rinse rim such as rinse rim **78** is provided on or coupled to the overflow rim **30** of the flush engine **12**. This may be a manual process or may utilize an assembly robot. According to other embodiments, the flush engine **12** and the bowl insert **56** may be inverted and provided onto the rinse rim **78**, which is also inverted. As the rinse rim **78** is moved closer to the overflow rim **30**, the plurality of fingers **86** engage the second portion **34** of the overflow rim **30**, which forces at least a portion of the plurality of fingers **86** to expand laterally outward. After the lower surface **85** of the rinse rim **78** is disposed on the overflow rim **30**, the plurality of fingers **86** rebound to an non-deflected condition, such that at least a portion of the below the first portion **32** of the overflow rim **30**, coupling the rinse rim **78** to the overflow rim **30** with an interference fit. According to other exemplary embodiments, the rinse rim **78** may be coupled to the overflow rim **30** with single finger **86** or other structure providing an interference fit or may be coupled to the overflow rim **30** in other ways (e.g., with a fastener, adhesive, etc.).

In a third step **206**, an overflow nozzle in the overflow rim is fluidly connected to a trapway. For example, with reference to the accompanying figures, an overflow nozzle such as overflow nozzle **36** extends from the overflow rim **30**. An overflow waterway **42** is coupled to the overflow nozzle **36** and to the trapway **22**. During operation of the toilet assembly **10** during a flush cycle, if the trapway **22** is clogged, causing water to rise above the first portion **32** of the overflow rim **30** (and above the top surface of the lip **66** of the bowl insert **56**), water passes in a channel formed between the lip **66** of the bowl insert **56** and the second portion **34** of the overflow rim **30**. The water then passes from this channel, through the overflow nozzle **36** and the overflow waterway **42** before being fed to the trapway **22** or the intervening overflow trapway **48**.

According to an exemplary embodiment, the overflow waterway **42** is fluidly coupled to an overflow trapway **48**, which is connected to the trapway **22**. The overflow trapway **48** forms a water lock configured to prevent gases in the trapway **22** from exiting the trapway **22** through the overflow trapway **48**. The overflow waterway **42** may be press-fit onto the overflow nozzle **36** and/or the overflow trapway **48**, or may be coupled to the overflow nozzle **36** and/or the overflow trapway **48** in other ways (e.g., threadably coupled, glued, etc.).

In a fourth step **208**, a tank is fluidly coupled to the flush engine. For example, with reference to the accompanying figures, a tank such as tank **92** is provided on and coupled to the flush engine **12** at a platform **108** disposed on the trapway **22**. The tank **92** is provided with a conduit **94** defining a rinse outlet **96** and a separate sump outlet **98** for separately outputting water from the tank **92**. The rinse outlet **96** is fluidly coupled to the rinse rim **78** at the rinse nozzle **82**. Specifically, the rinse waterway **100**, which may be formed from a flexible or rigid material that is not vitreous china, is coupled to and extends between the rinse outlet **96** and the rinse rim **78** (in particular the rinse nozzle **82** for supplying water from the tank **92** to the rinse rim **78**). The rinse waterway **100** may be press-fit onto the rinse outlet **96** and/or the rinse nozzle **82**, or may be coupled to the rinse outlet **96** and/or the rinse nozzle **82** in other ways (e.g., threadably coupled, glued, etc.). Similarly, the sump outlet **98** is fluidly coupled to the sump **62** at the sump nozzle **72**. Specifically, the sump waterway **102**, which may be formed from a flexible or rigid material that is not vitreous china, is coupled to and extends between the sump outlet **98** and the sump **62** (in particular the sump nozzle **72** for supplying water from the tank **92** to the sump **62**). The sump waterway **102** may be press-fit onto the sump outlet **98** and/or the sump nozzle **72**, or may be coupled to the sump outlet **98** and/or the sump nozzle **72** in other ways (e.g., threadably coupled, glued, etc.).

While the figures show the fourth step **208** including coupling the tank **92** to the flush engine **12**, it should be understood that the according to other exemplary embodiments, the flush engine **12** may be supplied with water from a water supply line (not shown) instead of or in addition to the tank **92**. For example, a water supply line may be provided in a wall in a bathroom. The water supply line provides pressurized water to the conduit **94**, which then separates the water into streams in each of the rinse outlet **96** and the sump outlet **98** for outputting to the rinse rim **78** and the sump **62**, respectively. According to another exemplary embodiment, the water supply line may include two separate water supply lines (e.g., first and second water supply lines). In this configuration, the rinse waterway **100** and the sump waterway **102** may be coupled to the water supply lines without an intervening conduit **94**. For example, the rinse waterway **100** may be coupled to the first water supply line and the sump waterway **102** may be separately coupled to the second water supply line.

In a fifth step **210**, a pedestal shroud is installed on a flush engine **12**. For example, with reference to the accompanying figures, a pedestal shroud such as pedestal shroud **112** is disposed about and positioned over the flush engine **12**. The pedestal shroud **112** is lifted above the ground, such that the shoulder **121** is positioned above and further away from the ground than the rinse rim **78**. In this configuration, the fifth step **210** includes receiving the flush engine **12**, including the bowl **14** and the rinse rim **78**, through the rear end **122** of the pedestal shroud **112** and sliding the pedestal shroud **112** rearward relative to the flush engine **12**. According to

another exemplary embodiment, the pedestal shroud **112** is lifted above the ground, such that a bottom surface of the pedestal shroud **112** is positioned above and further away from the ground than the rinse rim **78**. In this configuration, the fifth step **210** includes receiving the flush engine **12**, including the bowl **14** and the rinse rim **78**, through the bottom surface of the pedestal shroud **112**. In either configuration, when the opening **120** in the pedestal shroud **112** is substantially vertically aligned with the opening **80** in the rinse rim **78**, the pedestal shroud **112** is lowered onto the flush engine **12**, such that the shoulder **121** is disposed laterally inward from and proximate the inner surface **88** of the rinse rim **78**, thereby concealing the rinse rim **78** from view by a user.

In a sixth step **212**, a tank shroud is installed about a tank and on a pedestal shroud. For example, with reference to the accompanying figures, a tank shroud such as tank shroud **114** is disposed about and positioned over the tank **92**. The tank shroud **114** is lifted above the ground, such that the lower surface **134** of the tank shroud **114** is positioned above and further away from the ground than the platform **108** and/or the upper surface **118** of the pedestal shroud **112**. In this configuration, the sixth step **212** includes receiving the tank **92** through the rear end **132** of the tank shroud **114** and sliding the tank shroud **114** rearward relative to the tank **92**. According to another exemplary embodiment, the tank shroud **114** is lifted above the ground, such that the lower surface **134** of the tank shroud **114** is positioned above and further away from the ground than the tank **92**. In this configuration, the sixth step **212** includes receiving the tank **92** through the lower surface **134** of the tank shroud **114**. When the tank shroud **114** is installed and the tank **92** is received therein, the tank **92** is concealed from view during use of the toilet assembly **10**, regardless of whether the tank **92** is inserted through an opening in either the rear end **132** or the lower surface **134** of the tank shroud **114**. As shown in the figures, the tank shroud **114** may be coupled to the tank **92** and/or the pedestal shroud **112**. For example, the lower surface **134** of the tank shroud **114** may be disposed on and engage the upper surface **118** of the pedestal shroud **112**.

While the method **200** shows a process for assembling a toilet assembly **10**, it should be understood that one or more of the steps in the method **200** may be performed in reverse in order to disassemble the toilet assembly **10**. For example, such process may be used in order to replace the pedestal shroud **112** and/or the tank shroud **114**. During a bathroom renovation, it may be desirable to replace toilets to provide a new desired aesthetic appearance. Rather than completely replacing the entire toilet, which will result in higher incurred costs, the pedestal shroud **112** (i.e., first pedestal shroud) and/or the tank shroud **114** (i.e., first tank shroud) may be replaced with a new pedestal shroud **112** (i.e., second pedestal shroud) and/or a new tank shroud **114** (i.e., second tank shroud) having different aesthetic appearances.

Referring now to FIG. **9**, a method **250** of assembling (i.e., modifying, renovating, replacing, retrofitting, etc.) a toilet assembly **10** is shown according to an exemplary embodiment. In a first step **252**, a toilet assembly is provided. For example, with reference to the accompanying figures, a toilet assembly may be the toilet assembly **10** including a universal flush engine **12**, a tank **92**, a first pedestal shroud **112** and a first tank shroud **114**.

In a second step **254**, a first tank shroud is removed (e.g., separated) from the tank. For example, with reference to the accompanying figures, a first tank shroud such as tank shroud **114** is originally disposed about the tank **92**. The second step **254** includes separating or removing the first tank shroud **114** from the tank **92** and the pedestal shroud **112**. For example, the second step **254** includes sliding the first tank shroud **114** forward relative to the tank **92** and passing the tank **92** through the rear end **132** of the first tank shroud **114**. The first tank shroud **114** is then separated from the tank **92** for removal from the toilet assembly **10**. According to another exemplary embodiment, the first tank shroud **114** is lifted upward away from the ground and separated from the tank **92**. According to other exemplary embodiments, the first tank shroud **114** may be removed from the toilet assembly **10** in other ways.

In a third step **256**, a first pedestal shroud is removed (e.g., separated) from the flush engine. For example, with reference to the accompanying figures, a first pedestal shroud such as pedestal shroud **112** is originally disposed about the flush engine **12**. The third step **256** includes sliding the first pedestal shroud **112** forward relative to the flush engine **12** and passing the flush engine **12** through the rear end **122** of the pedestal shroud **112**. The first pedestal shroud **112** is then separated from the flush engine **12** for removal from the toilet assembly **10**. According to another exemplary embodiment, the first pedestal shroud **112** is lifted upward away from the ground and separated from the flush engine **12**.

In a fourth step **258**, a second pedestal shroud is installed on and positioned over the flush engine. For example, with reference to the accompanying figures, a second pedestal shroud such as pedestal shroud **112** is disposed about the flush engine **12**. The second pedestal shroud **112** provides a different aesthetic appearance than the first pedestal shroud **112** and is configured to be coupled to the flush engine **12** in substantially the same way as the first pedestal shroud **112**. The second pedestal shroud **112** is lifted above the ground, such that the shoulder **121** is positioned above and further away from the ground than the rinse rim **78**. In this configuration, the fourth step **258** includes receiving the flush engine **12**, including the bowl **14** and the rinse rim **78**, through the rear end **122** of the second pedestal shroud **112** and sliding the second pedestal shroud **112** rearward relative to the flush engine **12**. According to another exemplary embodiment, the second pedestal shroud **112** is lifted above the ground, such that a bottom surface of the second pedestal shroud **112** is positioned above and further away from the ground than the rinse rim **78**. In this configuration, the fourth step **258** includes receiving the flush engine **12**, including the bowl **14** and the rinse rim **78**, through the bottom surface of the second pedestal shroud **112**. In either configuration, when the opening **120** in the second pedestal shroud **112** is substantially vertically aligned with the opening **80** in the rinse rim **78**, the second pedestal shroud **112** is lowered onto the flush engine **12**, such that the shoulder **121** is disposed laterally inward from and proximate the inner surface **88** of the rinse rim **78**, thereby concealing the rinse rim **78** from view by a user.

In a fifth step **260**, a second tank shroud is installed about a tank and on a second pedestal shroud. For example, with reference to the accompanying figures, a second tank shroud such as tank shroud **114** is disposed about the tank **92**. The second tank shroud **114** provides a different aesthetic appearance than the first tank shroud **114** and is configured to be coupled to the tank **92** and/or the second pedestal shroud **112** in substantially the same way as the first tank shroud **114**. For example, the second tank shroud **114** is lifted above the ground, such that the lower surface **134** of the second tank shroud **114** is positioned above and further away from the ground than the platform **108** and/or the upper surface **118** of the second pedestal shroud **112**. In this configuration, the

fifth step **260** includes receiving the tank **92** through the rear end **132** of the second tank shroud **114** and sliding the second tank shroud **114** rearward relative to the tank **92**. According to another exemplary embodiment, the second tank shroud **114** is lifted above the ground, such that the lower surface **134** of the second tank shroud **114** is positioned above and further away from the ground than the tank **92**. In this configuration, the fifth step **260** includes receiving the tank **92** through the lower surface **134** of the second tank shroud **114**. When the second tank shroud **114** is installed and the tank **92** is received therein, the tank **92** is concealed from view during use of the toilet assembly **10**, regardless of whether the tank **92** is inserted through an opening in either the rear end **132** or the lower surface **134** of the tank shroud **114**. As shown in the figures, the second tank shroud **114** may be coupled to the tank **92** and/or the second pedestal shroud **112**. For example, the lower surface **134** of the second tank shroud **114** may be disposed on and engage the upper surface **118** of the second pedestal shroud **112**.

It should be understood that while the method **250** shown in FIG. **9** includes replacing both the first tank shroud **114** and the first pedestal shroud **112**, according to other exemplary embodiments, only one of the first tank shroud **114** or the first pedestal shroud **112** may be replaced to change the aesthetics. For example, after the second pedestal shroud **112** is installed on the flush engine **12**, the first tank shroud **114** may be installed about the tank **92** on the second pedestal shroud **112**, such that the aesthetic appearance of the tank shroud **114** remains the same but the aesthetic appearance of the pedestal shroud **112** changes. Similarly, the third and fourth steps **256**, **258** directed to removing and replacing the pedestal shroud **112** may be skipped, such that the first pedestal shroud **112** remains installed and only the first tank shroud **114** is replaced with the second tank shroud **114**. In this configuration, the appearance of the pedestal shroud **112** remains the same but the aesthetic appearance of the tank shroud **114** changes. According to yet another exemplary embodiment, the first pedestal shroud **112** may be replaced with the second pedestal shroud **112** without first removing the tank shroud **114** or the toilet assembly **10** may not include a tank **92** or a tank shroud **114**, such that only the pedestal shroud **112** is replaced. According to yet another exemplary embodiment, the tank shroud **114** may be integrally formed with the pedestal shroud **112**, such that the second and third steps **254**, **256** are performed at the same time as each other and the fourth and fifth steps **258**, **260** are performed at the same time as each other.

As utilized herein, the terms "approximately," "about," "substantially," and similar terms are intended to have a broad meaning in harmony with the common and accepted usage by those of ordinary skill in the art to which the subject matter of this disclosure pertains. It should be understood by those of skill in the art who review this disclosure that these terms are intended to allow a description of certain features described and claimed without restricting the scope of these features to the precise numerical ranges provided. Accordingly, these terms should be interpreted as indicating that insubstantial or inconsequential modifications or alterations of the subject matter described and claimed are considered to be within the scope of this disclosure as recited in the appended claims.

It should be noted that the term "exemplary" as used herein to describe various embodiments is intended to indicate that such embodiments are possible examples, representations, and/or illustrations of possible embodiments (and such term is not intended to connote that such embodiments are necessarily extraordinary or superlative examples).

The terms "coupled," "connected," and the like as used herein mean the joining of two members directly or indirectly to one another. Such joining may be stationary (e.g., permanent) or moveable (e.g., removable or releasable). Such joining may be achieved with the two members or the two members and any additional intermediate members being integrally formed as a single unitary body with one another or with the two members or the two members and any additional intermediate members being attached to one another.

References herein to the position of elements (e.g., "top," "bottom," "above," "below," etc.) are merely used to describe the orientation of various elements in the FIGURES. It should be noted that the orientation of various elements may differ according to other exemplary embodiments, and that such variations are intended to be encompassed by the present disclosure.

It is to be understood that although the present invention has been described with regard to preferred embodiments thereof, various other embodiments and variants may occur to those skilled in the art, which are within the scope and spirit of the invention, and such other embodiments and variants are intended to be covered by corresponding claims. Those skilled in the art will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, manufacturing processes, etc.) without materially departing from the novel teachings and advantages of the subject matter described herein. For example, the order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. Other substitutions, modifications, changes and omissions may also be made in the design, operating conditions and arrangement of the various exemplary embodiments without departing from the scope of the present disclosure.

We claim:

1. An apparatus comprising:

a bowl, formed from a non-vitreous material, comprising an opening at an upper periphery of the bowl and a sump at a lower portion of the bowl;

an overflow rim, formed from a non-vitreous material, at the upper periphery of the bowl and including a supporting surface, wherein the overflow rim allows water to bypass the bowl when a water level of the bowl is above a predetermined level;

a bowl insert configured to be located in the bowl and received on the supporting surface of the overflow rim; and

a rinse rim defining at least one rinse opening configured to supply water from within the rinse rim into the bowl insert.

2. The apparatus of claim **1**, further comprising:

a shroud configured to be positioned over the bowl to conceal at least a portion of the bowl.

3. The apparatus of claim **2**, wherein the bowl insert and the shroud are formed from vitreous china.

4. The apparatus of claim **1**, further comprising:

a trapway extending from the sump.

5. The apparatus of claim 4, further comprising:
an overflow nozzle extending from the overflow rim and configured to pass excess water from the overflow rim to the trapway such that the excess water bypasses the bowl.
6. The apparatus of claim 4, further comprising:
a seal disposed around an opening of the trapway and compressed between the bowl and the bowl insert to prevent water from flowing between the bowl insert and the bowl.
7. An apparatus comprising:
a bowl, formed from a non-vitreous material, comprising an opening at an upper periphery of the bowl and a sump at a lower portion of the bowl;
an overflow rim, formed from a non-vitreous material, at the upper periphery of the bowl and including a supporting surface, wherein the overflow rim allows water to bypass the bowl when a water level of the bowl is above a predetermined level;
a bowl insert configured to be located in the bowl and received on the supporting surface of the overflow rim; and
a sump nozzle extending from the sump of the bowl, wherein the bowl insert defines a sump opening configured to align with the sump nozzle when the bowl insert is received in the bowl.
8. The apparatus of claim 7, further comprising:
a rinse rim defining at least one rinse opening configured to supply water from within the rinse rim into the bowl insert.
9. The apparatus of claim 8, further comprising:
an overflow nozzle configured to prevent water from reaching a seam between the rinse rim and the overflow rim.
10. The apparatus of claim 8, further comprising:
a vertical gap between the bowl insert and the rinse rim configured to allow water to flow past the rinse rim and into the overflow rim during an overflow condition.
11. The apparatus of claim 7, further comprising:
a shroud configured to be positioned over the bowl to conceal at least a portion of the bowl.
12. The apparatus of claim 11, wherein the bowl insert and the shroud are formed from vitreous china.
13. An apparatus comprising:
a bowl, formed from a non-vitreous material, comprising an opening at an upper periphery of the bowl and a sump at a lower portion of the bowl;
an overflow rim, formed from a non-vitreous material, at the upper periphery of the bowl and including a supporting surface, wherein the overflow rim allows water to bypass the bowl when a water level of the bowl is above a predetermined level;
a bowl insert configured to be located in the bowl and received on the supporting surface of the overflow rim;
a trapway extending from the sump, wherein the bowl insert defines a trapway opening configured to align with the trapway when the bowl insert is received in the bowl.
14. An apparatus comprising:
a bowl, formed from a non-vitreous material, comprising an opening at an upper periphery of the bowl and a sump at a lower portion of the bowl;
an overflow rim, formed from a non-vitreous material, at the upper periphery of the bowl and including a supporting surface, wherein the supporting surface receives a bowl insert; and
an overflow nozzle configured to prevent water from reaching a seam between a rinse rim and the overflow rim.
15. The apparatus of claim 14, further comprising:
a sump nozzle extending from the sump of the bowl, wherein the bowl insert defines a sump opening configured to align with the sump nozzle when the bowl insert is received in the bowl.
16. The apparatus of claim 14, further comprising:
a vertical gap between the bowl insert and the rinse rim configured to allow water to flow past the rinse rim and into the overflow rim during an overflow condition.
17. The apparatus of claim 14, further comprising:
an overflow nozzle extending from the overflow rim and configured to pass excess water from the overflow rim to a trapway such that the excess water bypasses the bowl.
18. A method of assembling a toilet, the method comprising:
providing a bowl defining a sump and an overflow rim, wherein the bowl is formed of a non-vitreous material;
inserting a bowl insert to rest on a supporting surface of the overflow rim, wherein the overflow rim allows water to bypass the bowl when a water level of the bowl is above a predetermined level;
aligning a trapway opening of the bowl insert with a trapway at a lower portion of the bowl; and
positioning a shroud over the bowl to conceal at least a portion of the bowl.
19. The method of claim 18, wherein the bowl insert and the shroud are formed from vitreous china.

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